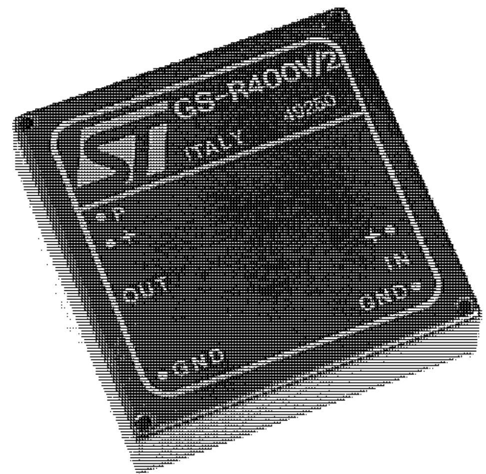
SGS-THOMSON MICROELECTRONICS

GS-R400/2 Family

SMALL SIZE STEP-DOWN SWITCHING REGULATOR FAMILY

FEATURES

- MTBF in excess of 500,000 hours
- 4A max output current
- 40V max input voltage
- 4V max drop-out voltage
- Soft start
- Non-latching short circuit protection
- Crow-bar output overvoltage protection



DESCRIPTION

The GS-R400/2 series is a family of small sized high current, high voltage step-down switching regulators.

The integral heatsink allows a large power handling capability and it provides also an effective shielding to minimize EMI.

SELECTION CHART

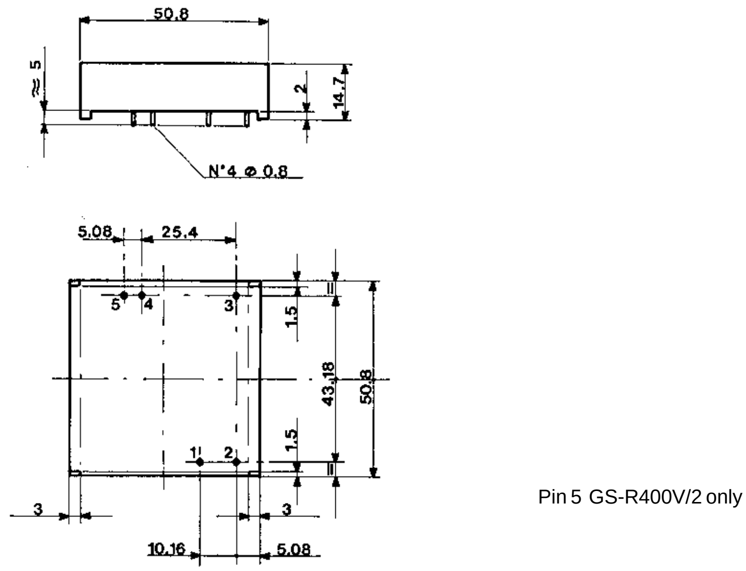
Type Ordering Number	Output Voltage (V)	Input Voltage (V)	Output Ripple (mVpp)	Regulation Line (mV/V)	Regulation Load (mV/A)	Efficiency (%)	Notes
GS-R405/2	5.1 ± 2%	9 to 40	25	2	20	80	Fixed output voltage
GS-R412/2	12.0 ± 4%	16 to 40	50	5	40	85	”
GS-R415/2	15.0 ± 4%	19 to 40	65	6	60	87	”
GS-R424/2	24.0 ± 4%	28 to 40	100	6	80	90	”
GS-R400V/2	5.1 to 24	Vo+4 to 40	25 to 100	2 to 6	20 to 80	80 to 90	Progr. output voltage

Note : Line regulation is measured at I_{out}=1A.
Load regulation is measured at $V_{in}=V_o$+8V and I_{out}=0.5 to 1.5A.
Case temperature must be kept below 85° C

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage	42	V
I_o	Output Current	4	A
T_{stg}	Storage Temperature Range	– 40 to +105	°C
T_{cop}	Operating Case Temperature Range	– 20 to +85	°C

CONNECTION DIAGRAM AND MECHANICAL DATA



Dimensions in mm   Bottom view

PIN DESCRIPTION

Pin	Function	Description
1	+ Input	DC input voltage. Recommended maximum voltage is 40V.
2	Input GND	Return for input voltage source.
3	Output GND	Return for output current path. Internally connected to pin 2.
4	+ Output	Regulated DC output voltage.
5	Program	A resistor (<10kΩ) connected between this pin and pin 4 sets the + output voltage of the GS-R400V/2.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$\Delta V_O/\Delta T$	Temperature Stability	$V_i = V_O$+8V I_O = 1A		0.2/0.6		mV/°C
I_O	Output Current	$V_i = V_O$+8V	0.1		4	A
I_{OL}	Current Limit	$V_i = V_O$+8V		5	8	A
I_{isc}	Average Input Current	V_i = 40V Output Shorted		0.1	0.2	A
f_s	Switching Frequency	I_O = 1A		100		kHz
SVR	Supply Voltage Rejection	f_O = 100Hz I_O = 1A		4/12		mV/V
V_r	Ripple Voltage	I_O = 1A		25/100		mVpp
t_{ss}	Soft Start Time			10/35		ms
t_{cb}	Crowbar Delay Time			5		µs
V_{cth}	Crowbar Intervention Threshold			V_O•1.25		V
R_{th}	Thermal Resistance	Case to ambient		8		°C/W

USER NOTES

Input Voltage

The recommended operating maximum DC input voltage is 40V inclusive of the ripple voltage.

Case Grounding

The module case is internally connected to pin 2 and pin 3.
The PCB area below the module can be used as an effective sixth side shield against EMI.

Thermal Characteristics

The case-to-ambient thermal resistance of all the GS-R400/2 modules is about 8°C/W. This produces a 32°C temperature increase of the module surface for 4W of internal power dissipation.
Depending on the ambient temperature and/or on the power dissipation, an additional heatsink or forced ventilation may be required.

Input Impedance

The module has an internal capacitor connected between the input pins in order to assure PWM stability. This capacitor cannot handle large values of high frequency ripple current and it can be permanently damaged if the primary energy source impedance is not adequate.
The use of an external low ESR, high ripple current capacitor located as close the module as possible is recommended.
Suitable capacitors should have a RMS current capability of 2.5 A_{RMS} with a working voltage of 50 V_{DC} and an ESR of 0,1Ω at 100kHz. When space is a limitation a 22µF ceramic multilayer capacitor must be connected to the module input pins.

Output Voltage Programming

The GS-R400V/2 output voltage is programmed by using a resistor.
The resistor must be located very close the module and the PCB layout must minimize injected noise. The value of the resistor is calculated by using the following formula:

$$R_V = 2.67\left(\frac{V_O}{5.1} - 1\right) k\Omega$$

V_O can be adjusted between 5.1 and 24V.

Module Protection

The modules are protected against occasional and permanent short circuits of the output pins to ground. During short circuit (when the output current exceeds the maximum value) the output is automatically disabled. After a fixed time the module starts again in a soft mode. The cycle is repeated until the short circuit condition is removed.

The module can be permanently damaged if the case temperature exceeds 85° C

Power Derating Curve

